

### REMARKS

This is a full and timely response to the nonfinal Office Action of September 18, 2001.

Reconsideration and allowance of the application and all presently pending claims are respectfully requested.

Upon entry of this Response, claims 1-64 are pending in this application. Claims 1, 7, 21, 34, and 36 are directly amended herein and claim 22 has been canceled, while claims 45-64 have been newly added. Claims 1, 7-13, 21-28, and 43 presently stand rejected under 35 U.S.C. §102(b) as being anticipated by *Murakami et al.* (U.S. Patent Number 4,796,082). In addition, claims 1-5, 9-10, 14-15, 18-21, 24-25, 29-30, 32-34, and 43 presently stand rejected under 35 U.S.C. §102(e) as being unpatentable over *Yagura et al.* (U.S. Patent Number 6,188,137). Further, claims 6, 16, 17, 31, 35-42, and 44 presently stand rejected under 35 U.S.C. §103 as being unpatentable over *Murakami* in view of *Yagura*. It is believed that the amendments and additions add no new matter to the present application.

### Response to §102 and §103 Rejections

For a proper rejection of a claim under 35 U.S.C. §102, the cited reference must disclose all elements/features/steps of the claim. See, e.g., *E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 7 USPQ2d 1129 (Fed. Cir. 1988). Further, in order for a claim to be properly rejected under 35 U.S.C. §103, the combined teachings of the prior art references must suggest all features of the claimed invention to one of ordinary skill in the art. See, e.g., *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q. 871, 881 (C.C.P.A. 1981). In addition, "(t)he PTO has the burden under section 103 to establish a *prima*

*facie* case of obviousness.” *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988)

(Citations omitted).

## **Response to §102 Rejections**

### **Claim 1**

Claim 1 presently stands rejected under 35 U.S.C. §102 as allegedly being anticipated by *Murakami* and *Yagura*. Claim 1 reads as follows:

1. A method for forming an ohmic contact on a semiconductor layer comprising:

(a) depositing a reactive layer comprising at least one electrically conductive material on at least a portion of a compound semiconductor layer, ***wherein the at least one electrically conductive material is chosen from nickel, ruthenium, vanadium, gold, and cobalt;*** and

(b) depositing a refractory layer comprising electrically conductive material on the reactive layer, wherein said refractory layer is substantially free of gold.

(Emphasis added). Applicants respectfully assert that *Murakami* and *Yagura* individually or in combination are inadequate to anticipate pending claim 1. In particular, *Murakami* and *Yagura* fail to disclose at least the features of pending claim 1 highlighted above. As indicated in the Office Action, *Murakami* teaches “depositing a reactive layer 18 comprising electrically conductive material (In-Ni)...,” while *Yagura* teaches “depositing a reactive layer 5/41 comprising electrically conductive material (WSi)...” However, amended claim 1 claims “depositing a reactive layer comprising at least one electrically conductive material..., wherein the at least one electrically conductive material is chosen from nickel, ruthenium, vanadium, gold, and cobalt...” Thus, the rejection to amended claim 1 under 35 U.S.C. §102 should be withdrawn.

### Claims 2-5

Claims 2-5 presently stand rejected in the Office Action under 35 U.S.C. §102 as allegedly being anticipated by *Yagura*. Applicants submit that the pending dependent claims 2-5 contain all features of their respective independent claim 1. Since claim 1 should be allowed, as argued hereinabove, pending dependent claims 2-5 should be allowed as a matter of law for at least this reason. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

### Claim 7

Claim 7 presently stands rejected under 35 U.S.C. §102 as allegedly being anticipated by *Murakami*. Claim 7 reads as follows:

7. The method according to claim 1 wherein said step of depositing a reactive layer comprising at least one electrically conductive material comprises depositing a thin reactive layer of ***at least one electrically conductive material chosen from nickel, ruthenium, vanadium, gold, and cobalt.***

(Emphasis added). Applicants respectfully assert that *Murakami* is inadequate to anticipate pending claim 7. In particular, *Murakami* fails to disclose at least the features of pending claim 7 highlighted above. *Murakami* teaches “depositing a reactive layer 18 comprising electrically conductive material (In-Ni)...” However, amended claim 7 claims “depositing a reactive layer comprising at least one electronically conductive material..., wherein the at least one electrically conductive material is chosen from nickel, ruthenium, vanadium, gold, and cobalt...” Thus, the rejection to claim 7 under 35 U.S.C. §102 should be withdrawn.

In addition, Applicants submit that pending dependent claim 7 contains all the features of respective independent claim 1. Since claim 1 should be allowed, as argued hereinabove, pending dependent claim 7 should be allowed as a matter of law for at least this reason. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

#### **Claims 8-15 and 18-20**

Claims 8 and 11-13 presently stand rejected in the Office Action under 35 U.S.C. §102 as allegedly being anticipated by *Murakami*. Claims 14-15 and 18-20 presently stand rejected in the Office Action under 35 U.S.C. §102 as allegedly being anticipated by *Yagura*. Claims 9 and 10 presently stand rejected in the Office Action under 35 U.S.C. §102 as allegedly being anticipated by both *Murakami* and *Yagura*. Applicants submit that the pending dependent claims 8-15 and 18-20 contain all features of their respective independent claim 1. Since claim 1 should be allowed, as argued hereinabove, pending dependent claims 8-15 and 18-20 should be allowed as a matter of law for at least this reason. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

#### **Claim 21**

Claim 21 presently stands rejected under 35 U.S.C. §102 as allegedly being anticipated by *Murakami* and *Yagura*. Claim 21 reads as follows:

21. An ohmic contact to a compound semiconductor layer comprising:
  - (a) a reactive layer ***comprising at least one electrically conductive material, wherein the at least one electrically conductive material is chosen from nickel, ruthenium, vanadium, gold, and cobalt,*** and
  - (b) a refractory layer, wherein said refractory layer is substantially free of gold.

(Emphasis added). Applicants respectfully assert that *Murakami* and *Yagura* individually or in combination are inadequate to anticipate claim 21. In particular, both *Murakami* and *Yagura* fail to disclose at least the features of pending claim 21 highlighted above. As indicated in the Office Action, *Murakami* teaches “depositing a reactive layer 18 comprising electrically conductive material (In-Ni)...,” while *Yagura* teaches “depositing a reactive layer 5/41 comprising electrically conductive material (WSi)...” However, amended claim 21 claims “a reactive layer comprising at least one electrically conductive material, wherein the at least one electrically conductive material is chosen from nickel, ruthenium, vanadium, gold, and cobalt...” Thus, the rejection to claim 21 under 35 U.S.C. §102 should be withdrawn.

#### **Claims 22-30 and 32-33**

Claims 22-23 and 26-28 presently stand rejected in the Office Action under 35 U.S.C. §102 as allegedly being anticipated by *Murakami*. Claims 29-30 and 32-33 presently stand rejected in the Office Action under 35 U.S.C. §102 as allegedly being anticipated by *Yagura*. Claims 24-25 presently stand rejected in the Office Action under 35 U.S.C. §102 as allegedly being anticipated by *Murakami* and *Yagura*. Applicants submit that the pending dependent claims 22-30 and 32-33 contain all features of their respective independent claim 21. Since claim 21 should be allowed, as argued hereinabove, pending dependent claims 22-30 and 32-33 should be allowed as a matter of law for at least this reason. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

### Claim 34

Claim 34 presently stands rejected under 35 U.S.C. §102 as allegedly being anticipated by *Yagura*. Claim 34 reads as follows:

34. An ohmic contact to a compound semiconductor layer comprising:  
(a) a reactive layer, said *reactive layer is nickel*; and  
(b) a refractory layer, said *refractory layer is titanium*,  
wherein said refractory layer is substantially free of gold.

(Emphasis added). Applicants respectfully assert that *Yagura* is inadequate to anticipate pending claim 34. In particular, *Yagura* fails to disclose at least the features of amended claim 34 highlighted above. As indicated in the Office Action, *Yagura* teaches “(a) depositing a reactive layer 5/41 comprising electrically conductive material (WSi)... and (b) depositing a refractory layer 42 comprising electrically conductive material (Pt).” However, amended claim 34 claims a “reactive layer is nickel, and ... a refractory layer is titanium...” Thus, the rejection to amended claim 34 under 35 U.S.C. §102 should be withdrawn.

### Claim 43

Claim 43 presently stands rejected under 35 U.S.C. §102 as allegedly being anticipated by *Murakami* and *Yagura*. Applicants respectfully assert that both *Murakami* and *Yagura* individually or in combination are inadequate to anticipate pending claim 43. In particular, *Murakami* and *Yagura* fail to disclose at least the features of pending claim 1 highlighted above. The ohmic contact of claim 43 is made by the method of claim 1. Thus the ohmic contact of claim 43 has a reactive layer comprising at least one electrically conductive material that is chosen from nickel,

ruthenium, vanadium, gold, and cobalt. Therefore, for at least the reasons stated in the argument hereinabove for claim 1, the rejection to claim 43 under 35 U.S.C. §102 should be withdrawn.

### **Response to §103 Rejections**

#### **Claims 6 and 16-17**

Claims 6 and 16-17 presently stand rejected in the Office Action under 35 U.S.C. §103 as allegedly being unpatentable over *Murakami* in view of *Yagura*. Applicants respectfully submit that pending dependent claims 6 and 16-17 include every feature of independent claim 1 and that *Murakami* and *Yagura* individually or in combination fail to disclose, teach, or suggest at least the features of claim 1 highlighted hereinabove. Thus, pending dependent claims 6 and 16-17 are allowable over the prior art of record, and the rejections to claims 6 and 16-17 under 35 U.S.C. §103 should be withdrawn. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

#### **Claim 31**

Claim 31 presently stands rejected in the Office Action under 35 U.S.C. §103 as allegedly being unpatentable over *Murakami* in view of *Yagura*. Applicants respectfully submit that pending dependent claim 31 includes every feature of independent claim 21 and that *Murakami* and *Yagura* individually or in combination fail to disclose, teach, or suggest at least the features of claim 21 highlighted hereinabove. Thus, pending dependent claim 31 is allowable over the prior art of record, and the rejection to claim 31 under 35 U.S.C. §103 should be withdrawn. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

### Claim 35

Claim 35 presently stands rejected in the Office Action under 35 U.S.C. §103 as allegedly being unpatentable over *Murakami* in view of *Yagura*. Applicants respectfully submit that pending dependent claim 35 includes every feature of independent claim 34 and that *Murakami* and *Yagura* individually or in combination fail to disclose, teach, or suggest at least the features of claim 34 highlighted hereinabove. Thus, pending dependent claim 35 is allowable over the prior art of record, and the rejection to claim 35 under 35 U.S.C. §103 should be withdrawn. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

### Claim 36

Claim 36 presently stands rejected under 35 U.S.C. §103 as allegedly being anticipated by *Murakami* in view of *Yagura*. Claim 36 reads as follows:

36. A method for forming an ohmic contact on a compound semiconductor layer of a semiconductor device comprising:
- (a) depositing a reactive layer on at least a portion of a compound semiconductor layer of a semiconductor device, ***wherein the reactive layer is nickel***;
  - (b) depositing a refractory layer on said reactive layer, said refractory layer is titanium, wherein said refractory layer is substantially free of gold.

(Emphasis added). Applicants respectfully assert that *Murakami* in view of *Yagura* individually or in combination fail to disclose, teach, or suggest at least the feature highlighted in claim 36. In particular, *Murakami* in view of *Yagura* fails to disclose at least the features of depositing a nickel reactive layer and depositing a titanium refractory layer. Thus, the rejection to claim 36 under 35 U.S.C. §103 should be withdrawn.

### **Claims 37-42**

Claims 37-42 presently stand rejected in the Office Action under 35 U.S.C. §103 as allegedly being unpatentable over *Murakami* in view of *Yagura*. Applicants respectfully submit that pending dependent claims 37-42 include every feature of independent claim 36 and that *Murakami* and *Yagura* individually or in combination fail to disclose, teach, or suggest at least the features of claim 36 highlighted hereinabove. Thus, pending dependent claims 37-42 are allowable over the prior art of record, and the rejections to claims 37-42 under 35 U.S.C. §103 should be withdrawn. *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

### **Claim 44**

Claim 44 presently stands rejected in the Office Action under 35 U.S.C. §103 as allegedly being unpatentable over *Murakami* in view of *Yagura*. Applicants respectfully submit that both *Murakami* and *Yagura* individually or in combination are inadequate to disclose, teach, or suggest at least the features of claim 44. In particular, *Murakami* and *Yagura* fail to disclose at least the features of pending claim 36 highlighted above. The ohmic contact of claim 44 is made by the method of claim 36. Thus the ohmic contact of claim 44 has a nickel reactive layer. Therefore, for at least the reasons stated in the argument hereinabove for claim 36, the rejection to claim 44 under 35 U.S.C. §103 should be withdrawn.

### New Claims

In addition, claims 45-64 are newly added to further define the invention, and are allowable for at least the same or similar reasons that claims 1-44 are allowable.

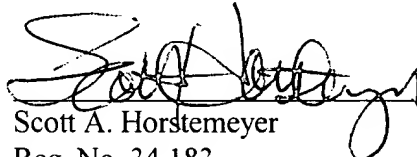
### CONCLUSION

Applicants respectfully request that this application and all presently pending claims be allowed to issue. If the Examiner has any questions or comments regarding Applicants' response, the Examiner is encouraged to telephone Applicants' undersigned counsel.

Respectfully submitted ,

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## ANNOTATED VERSION OF MODIFIED CLAIMS TO SHOW CHANGES MADE

Amend the following pending claims by deleting that language which is enclosed within brackets (“[ ]”) and by inserting that language which is underlined (“      ”).

1. A method for forming an ohmic contact on a semiconductor layer comprising:
  - (a) depositing a reactive layer comprising at least one electrically conductive material on at least a portion of a compound semiconductor layer, wherein the at least one electrically conductive material is chosen from nickel, ruthenium, vanadium, gold, and cobalt; and
  - (b) depositing a refractory layer comprising electrically conductive material on the reactive layer, wherein said refractory layer is substantially free of gold.
  
7. The method according to claim 1 wherein said step of depositing a reactive layer comprising at least one electrically conductive material comprises depositing a thin reactive layer of at least one electrically conductive material chosen from [comprising platinum, palladium, indium,] nickel, ruthenium, vanadium, gold, and cobalt [or mixtures, or compositions thereof].
  
21. An ohmic contact to a compound semiconductor layer comprising:
  - (a) a reactive layer comprising at least one electrically conductive material, wherein the at least one electrically conductive material is chosen from nickel, ruthenium, vanadium, gold, and cobalt, and
  - (b) a refractory layer, wherein said refractory layer is substantially free of gold.

34. An ohmic contact to a compound semiconductor layer comprising:

(a) a reactive layer, said reactive layer [comprising] is nickel [and having a thickness of from about 10 to about 500 angstroms]; and

(b) a refractory layer, said refractory layer [comprising] is titanium [and having a thickness of at least about 100 angstroms],

wherein said refractory layer is substantially free of gold.

36. A method for forming an ohmic contact on a compound semiconductor layer of a semiconductor device comprising:

(a) depositing a reactive layer [comprising nickel] on at least a portion of a compound semiconductor layer of a semiconductor device, [said reactive layer having a thickness of from about 10 to about 500 angstroms] wherein the reactive layer is nickel;

(b) depositing a refractory layer on said reactive layer, said refractory layer [comprising] is titanium [and having a thickness of at least about 100 angstroms],

wherein said refractory layer is substantially free of gold.